

wcd-2021-8

Editor decision – comments to the authors

On the occurrence of strong vertical wind shear in the tropopause region: A ten year ERA5 northern hemispheric study

by T. Kaluza et al.

Dear Thorsten

Many thanks for your revisions and for addressing the points raised by the reviewers in great detail. I am happy to accept your paper for publication in WCD subject to technical corrections, as listed below. In addition to these suggestions, I would like to invite you to consider shortening and/or simplifying the text in a few places. The text is very detailed and a bit heavy in some places. Some remarks appear to me as side remarks that maybe also could be omitted, for the benefit of an even better flow of the entire paper. I leave this to your discretion.

L6: S_t^2 is not yet defined, say that it refers to the squared vertical shear of the horizontal wind speed.

L6 and in several other places: “spectrum”? maybe better “distribution”? You later use “spectrum” for the wave or frequency spectrum (which I find fully OK), but then it is slightly confusing to me that the simple distribution of shear values is also called spectrum.

L15 and in other places: “near to the tropopause” → “near the tropopause”

L25: “la Nina” should read “La Nina”

L39: “... and the squared ...”

L68: “expand ... and present” should read “expanded ... and presented”

L92: “describe” should read “described”

L107: not clear to me what “vertical and lateral shear zones” are. In both cases do you still mean vertical shear of the horizontal flow? So maybe you mean “... with shear zones vertically spanning ... and laterally over several hundreds of kilometres”?

L120: “confirm” should read “confirmed”

L131: should read “orographically induced”

L145: should read “of small-scale perturbations”

L149: “analyse” should read “analysed”

L165: I suggest deleting “as a reference dataset”

L166: why “central”?

L167: The sentence “This approach ...” is rather complicated. Can you say the same with simpler words?

L188: no need to repeat the WMO criteria, which you already listed in the introduction

Caption Fig. 1: why “tropospheric volume”, why not just “Blue indicates values in the troposphere”?

L197: latex use `\sin` for the sine symbol

L206: not sure that “larger resolved spectrum” is the right term here, maybe “in a bias towards larger values of vertical wind shear”?

L220: I don’t understand “the mostly exclusive occurrence”, maybe “the rare occurrence”?

L234: I think the “northwest Atlantic” should read “western North Atlantic”

L249: instead of “grid box volume” maybe simpler “... at least at one level between ...”?

L264: delete “i.e.”, or should it be “e.g.”?

Caption Fig. 5: I don’t understand “regions where negative (positive) vertical wind shear makes for 75 % of the counts”

L270: “at the LRT”? maybe better “near the LRT”?

L278: “controvertible”? I don’t understand, do you maybe mean “controversial”?

L291/296: we don’t call this a “PV streamer”, rather a “tropopause fold”. PV streamers are identified on isentropic PV charts, not in vertical cross-sections.

L291-294: I would delete these two sentences; I find them a bit shaky (what is “thermal wind forcing”?) and they are not really needed.

L296: “at the upper edge of the ...”

L298: “more smooth” should read “smoother”

L324: I am not sure that the tropopause folds are the main reason for the fact that the 2-pvu tropopause is on average lower than the LRT (folds are relatively rare).

L340: “... winter, when it is located over the maritime ...”

L345: “narrow down”? maybe better “discuss”?

L374 and in many other places: please check, but I think “the Northeast Pacific” should read “the eastern North Pacific” and likewise for Northwest Atlantic etc.

L378: “On the one hand ...”

Caption Fig. 10: “location of Fig. 8c”? Maybe rather Fig. 9?

L450: not clear to me what “ $dz = 20$ meter” means

L454: no need to introduce abbreviations (COT) that are not used later

L458: “over the maritime continent”

L463: you already introduced the abbreviation ENSO earlier

L472: why “responsible”?

Caption Fig. 14: panel a): the R_i contours should be labeled

L506: “in the North Atlantic ..., Kaluza ... described ...”

L509: what do you mean by “an exclusive direct effect on either”? maybe “a contrasting effect on the two parameters”?

L526: typo “the the”

L527: “underestimation of the ...”

L514-535: I don't understand the need for this paragraph. It reads like a maybe interesting side aspect, but it somehow distorts the flow of this discussion sector. I know you included this in a response to a reviewer comment, but for me it would be sufficient (or better) to include this paragraph only in the reply document.

L537: what are the dashed variables? And **k** should be bold. Not sure that you need here a mathematical notation because T' etc. are not mentioned again.

L544: I don't understand, how can gravity wave activity be enhanced in a model at a scale that is not resolved?

L554: do you mean "higher horizontal resolution"?

L629: El Nino and La Nina with capital E and L

L664ff (References): WCD uses journal abbreviations, e.g., "J. Geophys. Res." etc. Please check in published WCD papers and adjust the journal names.

I am looking forward to receiving the final version of your manuscript.

With best regards,

Heini